Comanche Station
Response to EPA Question About Statistical Methods Selection

Background Threshold Values

Under the detection monitoring programs of 40 CFR 257.94, Appendix III monitoring results will be statistically compared to BTVs through interwell statistical methods. As recommended by the EPA Unified Guidance (2009b), the statistical test to define the background threshold value (BTV) for detection monitoring will be the upper prediction limit after eight background samples have been collected. The formulation of the prediction limit may vary slightly with the particulars of the test to be made based on the characteristics of the data involved such as whether the data follow parametric or non-parametric distributions and the percentage of NDs. For example, in the case of log-normally parametrically distributed data, the prediction limit is described by the mean and standard deviation of the natural log of the observations. The confidence level associated with each upper prediction limit test is selected such that the site-wide false positive rate does not exceed 10 percent as recommended by the Unified Guidance (2009b). The per-test confidence levels will typically range between 95 and 99 percent. Whatever the formula specification, prediction limits represent a range where a future result is expected to lie at a given confidence level. Both the upper and lower prediction limits (LPL) will be produced for pH since lower and higher pH values relative to background are of concern.

The background well at Comanche (W-2A) is a newly installed well (completed in August 2020); therefore prior to the November 30, 2020 deadline for submittal of the Part A Demonstration, four background samples will have been collected. In this circumstance of four background samples for development of the BTV, the non-parametric prediction limit will be used to establish the interim BTV. If all four rounds of data collected are non-detects, the double quantification rule (EPA Unified Guidance 2009b) will be used as the reference method. Groundwater sampling will continue after the Alternative Capacity Demonstration submittal and the BTV will be updated after a total of eight background samples have been collected and analyzed.

Determination of Statistically Significant Increases above Background

If the groundwater concentration of any Appendix III constituent at any downgradient well is greater than the BTV, then that concentration represents an SSI over background. One exception is pH, which can exhibit an SSI if the concentration in a monitoring well is either greater than the BTV or less than the minimum pH value observed at the background well. The CCR Rule, as described in 40 CFR 257.94(e), indicates that if an SSI over background is identified at the waste boundary for one or more Appendix III constituents during detection monitoring, then the owner or operator of the CCR unit must, within 90 days: 1) establish an assessment monitoring program, 2) demonstrate that a source other than the CCR unit caused the SSI over background,

or 3) demonstrate that the SSI over background resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

If sources other than the CCR Unit, natural variability or errors have been ruled out as the reason for the SSI, a type of verification sampling method called the one-of-m pass method, as described in the Unified Guidance (2009b), allows for an efficient plan to confirm if an SSI over background identified during detection monitoring resulted from the CCR unit. Resampling of wells where an SSI has occurred can either verify the initial SSI determination or disconfirm it, thereby avoiding false positives. Depending on the number of background samples, the selected site-wide false positive rate, and the available time period in which to do the resampling, either a 1-of-2 or 3 pass method is recommended should verification sampling be considered.

Assessment Monitoring Program, if Established

Under the assessment monitoring program in 40 CFR 257.95, Appendix III and IV monitoring results will be compared to BTVs as described in 40 CFR 257.95(e). The BTVs discussed above are also used to compare Appendix III and IV assessment monitoring results to background values.

According to 40 CFR 257.95(e), the CCR unit may return from assessment monitoring to detection monitoring when all Appendix III and Appendix IV constituents are "shown to be at or below background values, using the statistical procedures in paragraph 40 CFR 257.93(g) for two consecutive sampling events." A notification letter stating that detection monitoring is resuming for the CCR unit will be placed in the facility's operating record as required by 257.105(h)(7).

According to 40 CFR 257.95(f), if assessment monitoring concentrations of all Appendix III and Appendix IV constituents are above background concentrations (UPLs) and Appendix IV constituents are below the groundwater protection standard (GPS), then assessment monitoring will continue. As required in 40 CFR 257.95(h), the CCR owner must establish GPS for each constituent in Appendix IV detected in the groundwater. The GPS shall be defined as the following:

- The U.S. EPA Maximum Contaminant Level (MCL) for constituents for which an MCL has been established;
- the background concentration for constituents for which an MCL has not been established, or
- the background concentration for constituents for which the background level is higher than the U.S. EPA MCL established.

The Unified Guidance recommends the upper tolerance limit (UTL) to represent the background concentration for this purpose. The limits can be considered as statistically equivalent BTVs to an MCL or other health-based numbers. The UTLs are derived from the same background data

sourced to produce the UPLs and are used in these situations to represent the GPS. Tolerance intervals represent a range where a proportion of the population is expected at a given confidence level. For the purpose of this certification plan, a 95 percent confidence level is assumed. Similarly to the specification for prediction limits, specification for tolerance limits vary depending on whether the background data follow parametric or non-parametric distributions and the incidence of NDs. Both the upper and lower tolerance limits will be produced for pH to establish lower and upper GPS.

Determination of Statistically Significant Levels above GPS

The CCR Rule stipulates in 40 CFR 257.95(g) that if Appendix IV constituents are detected as statistically significant levels (SSLs) above the GPS, the following actions are required to be taken by the owner:

- Place a notification in the operating record identifying the GPS exceedances.
- Characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected in accordance with 40 CFR 257.97.
- Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination.
- Within 90 days:
    - Prepare an alternative source determination for the exceedance, or
    - Initiate an assessment of corrective measures in accordance with 40 CFR 257.96.

Therefore, if Appendix III and detected IV COIs exceed BTVs according to 257.95(e), and detected Appendix IV COIs exceed GPS per 257.95(f), then detected Appendix IV constituents will be statistically compared to the GPS to identify SSLs above the GPS per 257.95(g). In order to evaluate if an exceedance of the GPS is statistically significant, the lower confidence limit concentrations from downgradient monitoring wells are used.

During the statistical analysis of confidence intervals from each detected Appendix IV constituent, if the lower confidence limit exceeds the GPS at the 95 percent confidence level, then the constituent has been detected at an SSL above the GPS at a particular monitoring well. As with the UPL and UTLs, the particularities of the lower confidence limit are based on whether parametric or non-parametric distributions best fit the data and the incidence of NDs observed in the monitoring data. For example, in the case of normally distributed data, a normal-based parametric confidence interval is used. If the data cannot be explained by parametric distributions, a non-parametric confidence interval on the median is used.